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ATTORNEY'S DOCKET NUMBER

Bhatooolaul 7-20-6

U.S. APPLICATION NO. (If known, see 37 CFR 1.5)

09/936101

PRIORITY DATE CLAIMED

18 March 1999

INTERNATIONAL APPLICATION NO.

PCT/GB99/04180

INTERNATIONAL FILING DATE

10 December 1999

TITLE OF INVENTION

Improved Message Access for Radio Telecommunications System

APPLICANT(S) FOR DO/EO/US

David Lahiri Bhatooolaul, Qiang Cao, Seau Siam Lim

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items 11 to 20 below concern document(s) or information included:**

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information:

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Margaret R. Walton	
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U.S. APPLICATION NO. (if known) <b>09/936101</b> INTERNATIONAL APPLICATION NO. <b>PCT/GB99/04180</b>	ATTORNEY'S DOCKET NUMBER <b>Bhatoola 7-20-6</b>
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21. ☐ The following fees are submitted:

**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):**

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. .... **\$1000.00**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO .... **\$860.00**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO .... **\$710.00**

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) .... **\$690.00**

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) .... **\$100.00**

**ENTER APPROPRIATE BASIC FEE AMOUNT =**

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$
Total claims	5 - 20 =	0	x \$18.00	\$ 0
Independent claims	2 - 3 =	0	x \$80.00	\$ 0
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$270.00
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$ 860.00

☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.

**SUBTOTAL =**

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).

**TOTAL NATIONAL FEE =**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **\$40.00** per property +

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a. ☐ A check in the amount of \$ \_\_\_\_\_ to cover the above fees is enclosed.

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**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

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*Claude R. Narcisse*  
 SIGNATURE  
 Claude R. Narcisse  
 NAME  
 38979  
 REGISTRATION NUMBER

FORM PTO-1390 (REV. 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER Bhatooolaul 7-20-6
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (If known, see 37 CFR 1.5) <b>09/936101</b>
INTERNATIONAL APPLICATION NO. PCT/GB99/04180	INTERNATIONAL FILING DATE 10 December 1999	PRIORITY DATE CLAIMED 18 March 1999	
TITLE OF INVENTION Improved Message Access for Radio Telecommunications System			
APPLICANT(S) FOR DO/EO/US David Lahiri Bhatooolaul, Qiang Cao, Seau Siam Lim			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
<ol style="list-style-type: none"> <li><input checked="" type="checkbox"/> This is a <b>FIRST</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li><input type="checkbox"/> This is a <b>SECOND</b> or <b>SUBSEQUENT</b> submission of items concerning a filing under 35 U.S.C. 371.</li> <li><input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.</li> <li><input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31).</li> <li><input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <ol style="list-style-type: none"> <li><input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).</li> <li><input checked="" type="checkbox"/> has been communicated by the International Bureau.</li> <li><input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</li> </ol> </li> <li><input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> <li><input type="checkbox"/> is attached hereto.</li> <li><input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4).</li> </ol> </li> <li><input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <ol style="list-style-type: none"> <li><input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).</li> <li><input type="checkbox"/> have been communicated by the International Bureau.</li> <li><input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</li> <li><input type="checkbox"/> have not been made and will not be made.</li> </ol> </li> <li><input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).</li> <li><input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</li> <li><input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</li> </ol>			
Items 11 to 20 below concern document(s) or information included:			
<ol style="list-style-type: none"> <li><input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</li> <li><input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</li> <li><input type="checkbox"/> A FIRST preliminary amendment.</li> <li><input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</li> <li><input type="checkbox"/> A substitute specification.</li> <li><input type="checkbox"/> A change of power of attorney and/or address letter.</li> <li><input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.</li> <li><input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4).</li> <li><input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).</li> <li><input type="checkbox"/> Other items or information:</li> </ol>			

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09/926101

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## IMPROVED MESSAGE ACCESS FOR RADIO TELECOMMUNICATIONS SYSTEM

This invention relates to an improved message access arrangement for a radio telecommunications system such as Universal Mobile Telecommunications System (UMTS) and relates especially to message acquisition indications.

To make a connection to the UMTS system, in known arrangements a mobile telephone sends its preamble at a first power, and waits for an acquisition indication on the Acquisition Indication Channel (AICH); if no indication is received, the preamble is resent at increased power, in steps, until an indication is received on the AICH. The message is then sent and if no positive acknowledgement is received via the Forward Access Channel (FACH), the message is assumed to be corrupted and it is resent. The arrangement is set out in I-95 and UMTS standards.

In WO/98/18280 Ericsson, there is disclosure of a mobile communications system in which, during call set up, a mobile station transmits a random access packet that includes a preamble and a plurality of fields; more efficient call set up is facilitated. Further, each mobile station transmits a different preamble symbol pattern, and each base station receiver includes a plurality of accumulators, each tuned to a different preamble symbol pattern. Consequently, the base station can distinguish between simultaneous random access requests.

A problem with the prior art arrangements is that the base transceiver station must always have a sufficient level of hardware redundancy to ensure that the message parts of all detected preambles can be processed. This adds a high cost to the base transceiver station, and limits the number of access slots and preamble signatures allowed for each base transceiver station to achieve a given message throughput.

It is the object of the invention to provide a system which has a reduced requirement for hardware redundancy.

According to the invention a radio mobile telecommunications system comprises a base transceiver station arranged to manage a plurality of mobile systems within at least one telecommunications cell; the base station having means to provide an acquisition

indication channel by which an acknowledgement signal is sent to indicate that the strength of a preamble signal sent by that mobile system to the base transceiver station has reached a predetermined level; characterised in that said acknowledgement signal is arranged to indicate in addition that the mobile system must not immediately send a message signal.

In the accompanying drawings, the prior art is illustrated in figures 1 - 7 in which:-

Figure 1 is a schematic diagram of a part of a radio telecommunications system;

Figure 2 illustrates a physical random access channel slots structure;

Figure 3 illustrates the structure of a random access transmission;

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Figure 4 illustrates the structure of an access burst from a mobile;

Figure 5 illustrates the message part of the random access burst;

Figure 6 illustrates the layers involved in message acknowledgement and

Figure 7 illustrates how random access acquisition indication and forward  
5 access channels interact to acknowledge preamble and message signals from a mobile.

The invention will be described with reference to Figures 8 and 9 in which:-

Figure 8 indicates RACH and AICH messages in one embodiment of the  
invention; and

Figure 9 indicates RACH and AICH messages in a second embodiment of the  
10 invention.

In Figure 1, a part 10 of the UMTS is illustrated, comprising a plurality of  
mobile systems 10, 12, 14, 16 associated with a telecommunications cell controlled by  
a Base Transceiver Station (BTS) 18 having a Base Station Controller (BSC) 20.

When a mobile such as 12 wishes to make a call, it utilises the Random Access  
15 Channel (RACH) of the UMTS which is mapped to the Physical Random Access  
Channel (PRACH). Transmission in this transport channel is based on the well known  
slotted Aloha approach, that is, a mobile can start a transmission of the PRACH at any  
one of a number of well defined time offsets, denoted access slots AS and illustrated in  
Figure 2. The slots are spaced 1.25 milliseconds apart. Several of the slots in Figure 2  
20 are shown as filled by random access transmissions 30, 32, 34, 36.

Figure 3 illustrates the structure of a Random Access Transmission such as  
transmission 30; there are several preamble parts 40a, 40b, 40i, each of length 1  
millisecond, and an access burst 42 which contains the preamble part, plus a message  
part of length 10 milliseconds.

Figure 4 shows the structure of the access burst 42. Between a preamble 40j  
25 and the message part 44 there is an idle time period of length 0.25 milliseconds. This  
idle period allows for detection of the preamble part and subsequent online processing  
of the message part.

Figure 5 shows that the RACH message part 44 consists of a data part 46,  
30 corresponding to the uplink Dedicated Physical Data Channel (DPDCH) and a Layer 1  
control part 48, corresponding to the uplink Dedicated Physical Control Channel

(DPCCH). The data and control parts 46, 48 are transmitted in parallel.

The data part 46 carries Layer 2/Layer 3 messages requesting radio resources or a user packet. The spreading factor of the data part is limited to  $SF_E\{256,128,64,32\}$  corresponding to channel bit rates of 16, 32, 64 and 128 Kbps respectively. The control part 48 carries pilot bits 50 and rate information 52, using a spreading factor of 256. The rate information indicates a spreading factor of the channelisation code which is used on the data part.

For RACH transmission, the technique of preamble power ramping is used, and the procedure used by a random request has the following actions:-

10

1 After cell search and synchronisation, the mobile 12 reads the Broadcast Control Channel (BCCH) (not illustrated) to get information about

i the preamble spreading code(s)

ii the available signatures

15

iii the available access slots

iv the available spreading factors for the message part

v the uplink interference level in the cell

vi the primary CCPCH (Common Control Physical Channel) transmit power level

20

2 The MS selects a preamble spreading code and thus the message scrambling code.

3 The MS selects a preamble signature and uses it to determine the primary node of the channelisation codes used by the message part of the access burst.

25

4 The MS selects a channelisation code (corresponding to a spreading factor) for the message part.

30 5 The MS estimates the downlink path loss (by using information about the transmitted and received power level of the primary CCPCH), and determines

the required uplink transmit power (by using information about the uplink interference level in the cell).

6. The MS implements the dynamic persistence algorithm by:
  - 5     • Reading the current dynamic persistence value from the BCH.
  - Performing a random draw against the current dynamic persistence value.
  - Deferring transmission for one frame and repeating step 6 if the result of the random draw is negative, otherwise proceeding to step 7.
- 10 7. The MS randomly selects an access slot from the available access slots.
8. The MS transmits its preamble at a negative power offset relative to the estimated uplink transmit power. This is illustrated at reference 60 in Figure 7.
- 15 9. The MS waits for an acquisition indication (on the AICH) from the network side. If none is received within a predefined time-out period, the MS transmits the preamble again but with a smaller power offset and a re-selected preamble signature, reference 62, showing the higher power.
- 20 10. Step 8 is repeated, reference 64, showing a further increase in power, and an acquisition indicator 66 is received from the network side that indicates the acceptance by the network side of the preamble at that power offset. The acquisition indicator 66 is received on the AICH.
- 25 11. If an acquisition indicator is received on the AICH in Step 9, the random access burst is transmitted in the next available access slot. This burst comprises a repeated preamble 64A and a message 68.
- 30 12. If the message 68 is corrupted, as indicated by the dotted lines, then there is no positive acknowledgement and actions 1 to 11 are repeated, references 70 to 78; message 78 is successfully received, and an acknowledgement 80 is sent



from the network on FACH.

Turning now to the first embodiment of the invention illustrated in Figure 8, as before the MS 12 sends three preamble signals 80, 82, 84 of increasing strength; when the BTS 18 receives signal 84, it now sends on the AICH an acknowledgement signal 86, variant I, which indicates to the MS 12 that the strength of the preamble 84 is acceptable (i.e. it has passed a Cyclic Redundancy Check (CRC) performed in the BTS 18) but that there is no hardware available to process the message immediately. In response, the MS 12 re-sends the preamble, 84A at the same strength as before. On receipt, the BTS 18 still does not have resources, and sends the second acknowledgement signal 86A, variant I. The mobile sends the preamble for the third time at the same strength, 84B; the BTS 18 now has resources and sends an acknowledgement signal 88, variant II which indicates that the MS 12 can now send its message; the MS sends preamble 84 again, 84C, and its message 90.

Variant II of the acknowledgement signal 88 is identical to the signal 66 and 76 in Figure 7.

A second embodiment of the invention is illustrated in Figure 9. As before, the MS 12 sends three preamble signals 80, 82, 84 of increasing strength; when the BTS 18 receives signal 84, at which the signal strength is acceptable, it sends on the AICH an acknowledgement signal 92. The signal 92 is sent when the BTS 18 does not currently have available hardware to process a message immediately, but is able to predict when resources will become available; the signal 92 contains a time out period T, after which hardware will become available. The MS 12 then waits for the period T since last sending its preamble, and resends the preamble at the same strength as before, 82A, and its message 90, i.e. a random access burst is transmitted in the next available time slot after the time out.

Unlike the previous variants, these acknowledgement signals now contain additional timing information indicating to the MS when to transmit its message burst. in application of the invention, the difference is that in step 11 the procedure now reads:

"If an acquisition indicator is received on the AICH in Step 9, the random

access burst is transmitted in the next available access slot as indicated by the timing information now included with this variant of the acknowledgement signal. This burst comprises a repeated preamble 64A and a message 68."

By use of the invention the available hardware resources are used efficiently,  
5 with minimum delays to call connection.

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In addition, as disclosed in our co-pending application number ~~99~~ filed on even date, the AICH can be used to send a negative acknowledgement to the MS 12 if reception of the message 90 fails the CRC performed in the BTS 18.

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## CLAIMS

- 1 A radio mobile telecommunications system comprises a base transceiver station (18) arranged to manage a plurality of mobile systems (12, 14, 16) within at least one telecommunications cell; the base station (18) having means to provide an acquisition indication channel by which an acquisition signal (86) is sent to indicate that the strength of the preamble signals (80, 82, 84) sent by a mobile system (12) to the base transceiver station (18) has reached a predetermined level (84); characterised in that said acknowledgement signal (86) is arranged to indicate in addition that the mobile 12 must not immediately send a message signal.
2. A system according to Claim 1 in which said acknowledgement signal (86) indicates that the strength of the preamble signal (84) is acceptable but the message signal (90) cannot be accepted at this time.
- 3 A system according to Claim 1 in which said acknowledgement signal (86) indicates that the strength of the preamble signal (84) is acceptable, and further indicates a predetermined time lag (T) after which the mobile system (12) is permitted to send its message signal (90).
- 4 A method of operating a radio mobile telecommunications system comprises :-  
sending spaced preambles (80, 82, 84) of increasing strength from a mobile (12) to a base transceiver station (18);  
sending a preamble acknowledgement signal (86) on an acquisition indication channel from the base transceiver station (18) to the mobile (12) when a preamble (84) reaches an acceptable strength; and  
sending a message signal (90) from the mobile (12) to the base transceiver station (18);  
characterised in that the preamble acknowledgement signal (86) further indicates that the mobile system (12) is not yet permitted to send its message signal (90).

- 5 5. A method according to Claim 4 in which the preamble acknowledgement signal (86) yet further indicates a time delay (T) after which the mobile system (12) is permitted to send its message signal (90).

FIG. 1

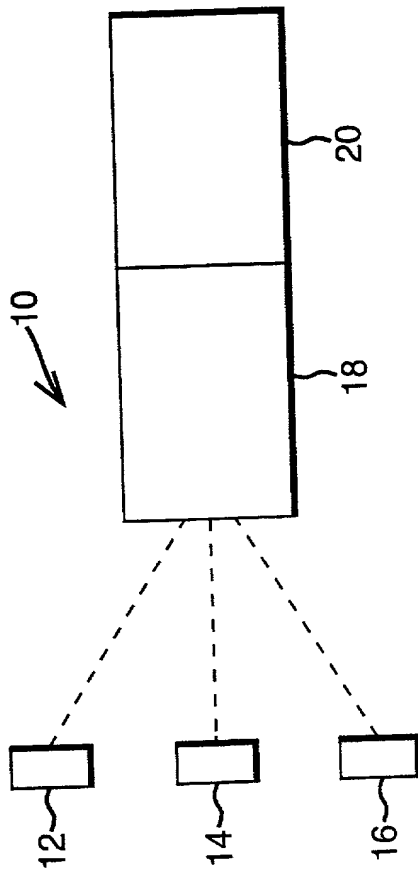


FIG. 2

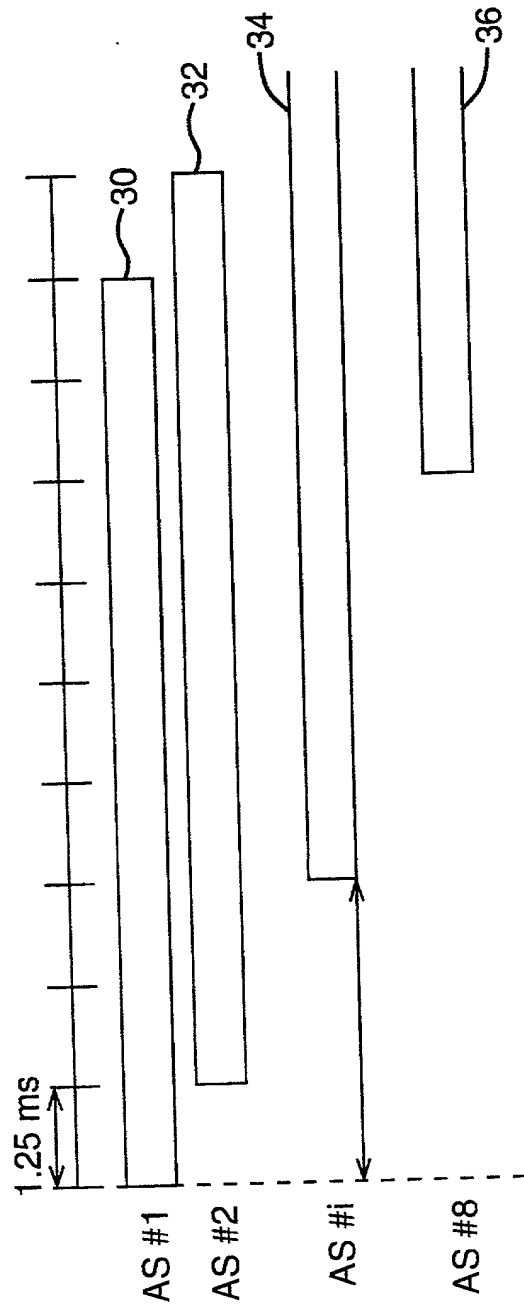


FIG. 3

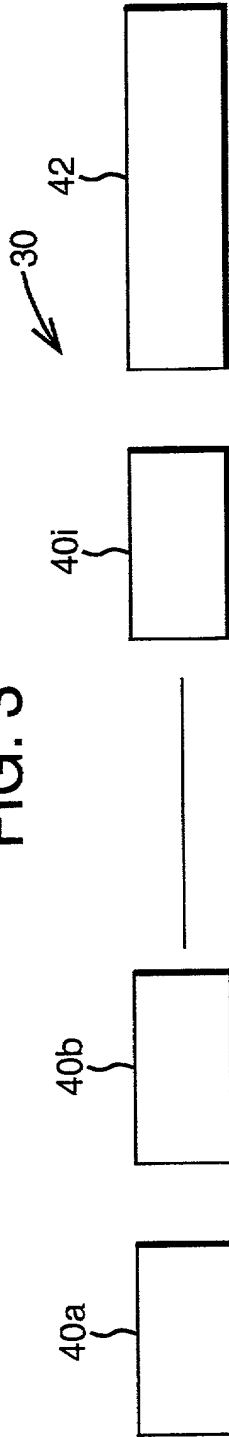


FIG. 4

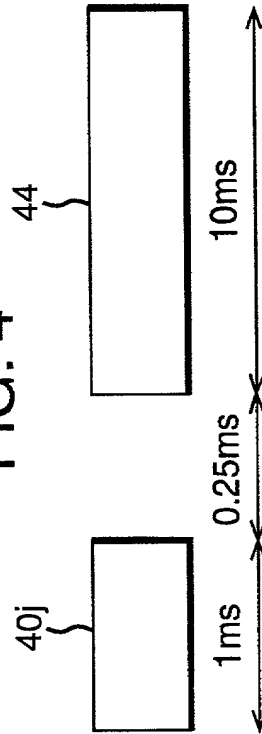


FIG. 5

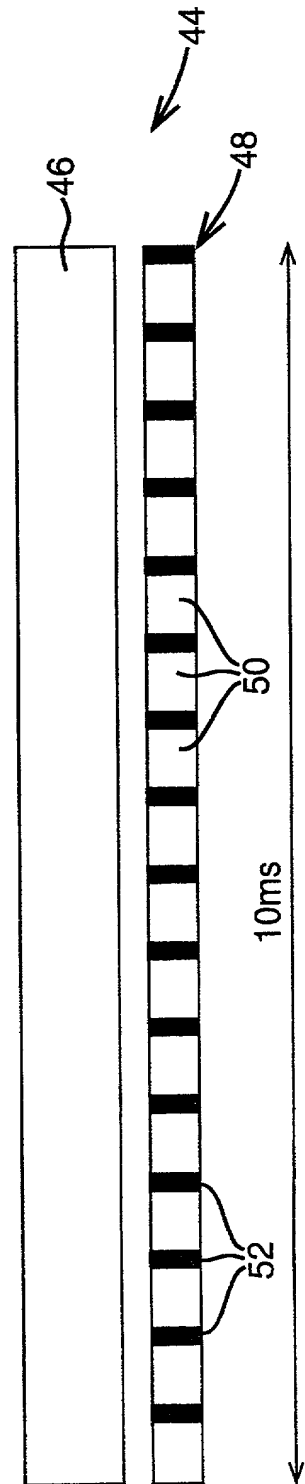


FIG. 6

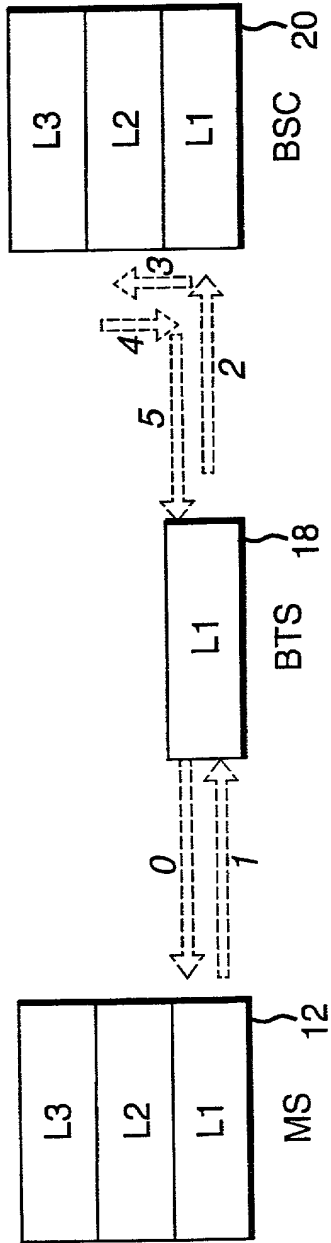


FIG. 7

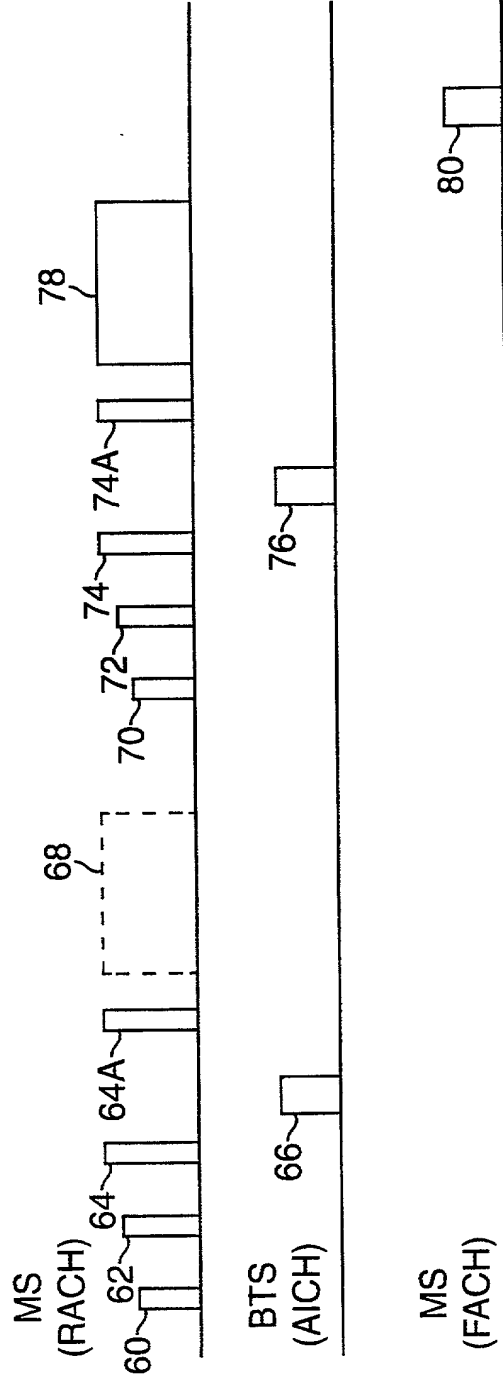


FIG. 8

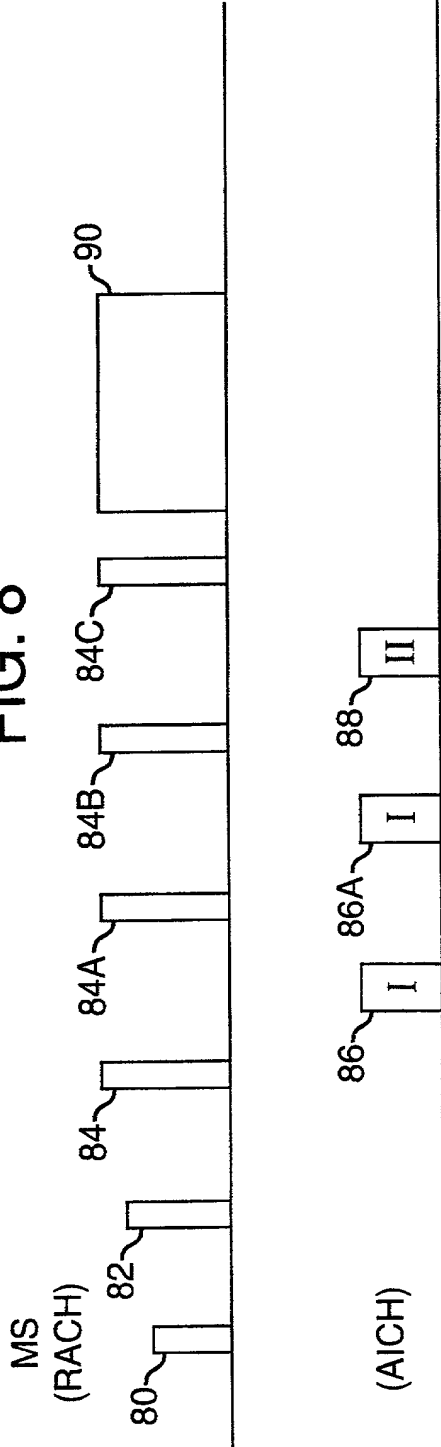
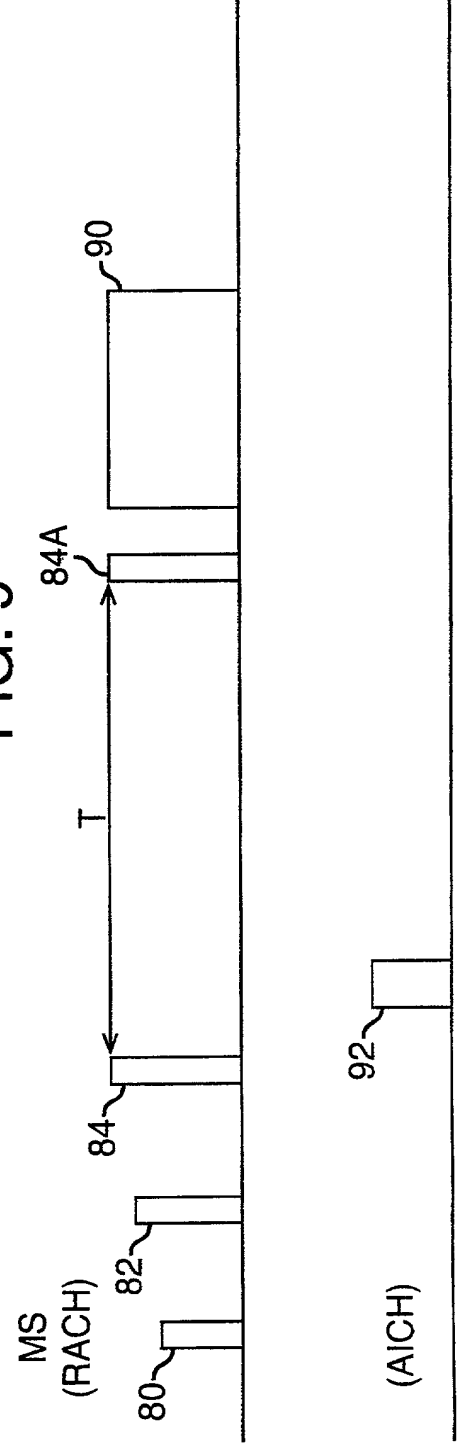


FIG. 9





IN THE UNITED STATES  
PATENT AND TRADEMARK OFFICE

Declaration and Power of Attorney

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled **Improved Message Access For Radio Telecommunications System** the specification of which

[ ] is attached hereto

OR

[ ] was filed on \_\_\_\_\_ and granted Application Serial Number \_\_\_\_\_.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment, if any, specifically referred to in this oath or declaration.

I acknowledge the duty to disclose all information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

**GB Application No. 9906198 filed 18 March 1999**

I hereby claim the benefit under Title 35, United States Code, 120 of any foreign application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

**International  
Application No.**  
PCT/GB99/04180

**Filing Date**  
10<sup>th</sup> December 1999

**Status**  
Pending

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

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Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorney(s) with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith:

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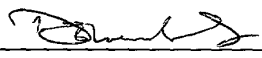
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I hereby authorize these attorneys to insert in the above blanks the filing date and application serial no. when known.

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09936101-090704

1-00 Full name of 1st joint inventor: David Lahiri Bhatoolaul

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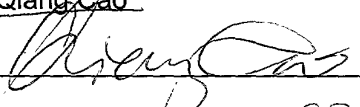
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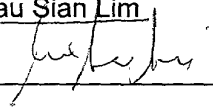
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